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United States  
Department of  
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Cooperative State  
Research Service

September 1987

# Animal Health Science Research Advisory Board

## 1986 Annual Report



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ANIMAL HEALTH SCIENCE RESEARCH ADVISORY BOARD

1986 ANNUAL REPORT

Cooperative State Research Service  
United States Department of Agriculture

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## EXECUTIVE SUMMARY

The New Animal Health Science Research Advisory Board was established by Public Law 95-113, the Food and Agriculture Act of 1977, to advise the Secretary on the implementation and priorities of animal health research authorized by the Act. This includes two new programs, authorizing extramural, Federal support for animal health research -- Section 1433, the Animal Health and Disease Formula Research Program, and Section 1414 ooo(c)(1), Special Research Grants for animal health. Both programs are administered by the Cooperative State Research Service and have received appropriations over 8 consecutive years (Fiscal Years 1979-1986). The Animal Health Science Research Advisory Board has provided consultation and advice essential to the implementation of these programs.

New research under these programs was initiated in Colleges and Schools of Veterinary Medicine, State Agricultural Experiment Stations, and in other cooperating institutions. Currently, research projects aimed at providing solutions to food animal health problems are being conducted under the Section 1433 Program. Under the Special Research Grant Program, 552 projects have been selected competitively for funding from 3,721 proposals submitted by scientists over an 8 year period. Many of these funded projects are still in progress.

This report summarizes (1) the current status of animal health research programs under Section 1433 and Special Research Grants, (2) 1986 recommendations and actions of the Animal Health Science Research Advisory Board, and (3) a special report of the National Academy of Sciences.

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ANIMAL HEALTH SCIENCE RESEARCH ADVISORY BOARD

1986 ANNUAL REPORT

I. Current Concerns in Animal Health

Losses from food animal diseases are estimated at \$15 billion a year. This touches every person in this nation, rich or poor, since it adds to the first-dollar-cost of food.

Because today we have surpluses, some policymakers may feel that we do not need to address these problems. One can debate how long surpluses will be the order of the day, but the major issue is the unnecessary billions of dollars lost each year because of inadequate technology to correct known problems in animal health.

Research is urgently needed to solve problems which cause inefficient production and reduced productivity. The emphasis is no longer on pounds and numbers but on quality and efficiency of use of capital inputs of labor, equipment, feed, facilities, land, drugs and antibiotics and other high cost chemicals.

Previously unimaginable improvements in production efficiency are now possible through application of "cutting edge" technologies of molecular biology and computer assisted systems. If these can be brought to bear on problems in animal health and disease facing the livestock and poultry industries today, tomorrow will surely bring solutions that have been evading researchers for decades.

The Food and Agriculture Act of 1977 (PL 95-113) recognized significant research opportunities to increase livestock production efficiency and food safety through emphasis on solving animal health problems.

Two new extramural programs were initiated which provide USDA support for animal health and disease research under authorizations of PL 95-113. These are the Animal Health and Disease Research (Section 1433) Formula Program and the Animal Health Special Research Grant Program, (Section 1414 (c)(1) amending Public Law 89-106). Provisions of these authorizations for animal health research were further strengthened under amendments included in Public Law 97-98, the Agriculture and Food Act of 1981, and Public Law 99-198, the Food Security Act of 1985. The U. S. Department of Agriculture Appropriation Act for Fiscal Years 1979-1986 has provided funds to carry out animal health research provisions of Public Law 95-113 and Public Law 99-198 at levels indicated in Table 1.

## II. Status of Programs

### 1. Section 1433, Animal Health and Disease Formula Program

#### Program Objectives

The Animal Health and Disease Formula Program (Section 1433) is directed toward improving the health and productivity of animals and the welfare of producers and consumers of animal products; protecting human health through control of animal disease transmissible to humans; minimizing livestock and poultry losses due to transportation and handling; facilitating the effective treatment and prevention of food animals and horse diseases, protecting livestock and poultry from diseases of wildlife; and providing improved methods of controlling birth of predators and other animals.

#### Approach

Under the Section 1433 formula program, the USDA has been able to strengthen its animal health research partnership with the State Agricultural Experiment Stations and to extend this partnership to all Colleges and Schools of Veterinary Medicine. Provisions of Sections 1433 are unique in that funds are distributed to the States in relation to State's livestock importance and its capacity to conduct animal health and disease research. When more than one eligible institution exists within a State, The State's entitlement is distributed to these institutions in accordance with their animal health research capacities. State contributions to expand animal health research are encouraged through a requirement that each State match any Section 1433 funds received annually in excess of \$100,000.

#### Formula Provisions

Section 1433 provides for support of livestock and poultry disease research in Colleges of Veterinary Medicine and in eligible State Agricultural Experiment Stations. These funds are distributed as follows:

48 percent are distributed in an amount proportionate to the value of and income to producers from domestic livestock and poultry in each State to total value of and income to producers from domestic livestock and poultry in all States.

Livestock Value (USDA-Data)	24%
Livestock Income (USDA-Data)	24%

48 percent are distributed in an amount proportionate to the animal health research capacity of the eligible institutions in each State to the total animal health capacity in all the States.

Expenditures for Animal Health Research	24%
(Eligible Institution Data)	
Scientist Years for Animal Health Research	24%
(Eligible Institution Data)	

Four percent is retained by the Department of Agriculture for administration, program assistance to the eligible institutions, and program coordination.

In a State with two or more eligible institutions, that State's allocation is distributed in the proportion that the animal health research capacities of these institutions bear to the total capacity of the State.

Eligible institutions must provide non-Federal matching funds in States receiving annual amounts in excess of \$100,000 under this authorization.

### Current Activities

For Fiscal Year 1986 a total of \$5,191,248 was distributed to 50 states and Puerto Rico. Funds were distributed to 39 Agricultural Experiment Stations, 12 Agricultural Experiment Stations and Colleges of Veterinary Medicine and 16 separate Colleges of Veterinary Medicine. The FY 1986 distribution reflects a 4.3 percent reduction as required by Gramm-Rudman legislation, and the requirement that 1.25 percent of funds must be set aside for the Small Business Innovation Research (SBIR) program. Programs of research were received from all institutions. The Gramm-Rudman reduction created some confusion in receiving programs of research.

Recommendations of the Animal Health Science Research Advisory Board are being followed in program administration by CSRS (i.e., scope and priorities of eligible research, determination of research capacity of eligible institutions, and other questions on program administration). In accordance with advice of the Board, emphasis in this research centers on the solution of high-priority diseases or other health hazards in the production of livestock, poultry, and aquaculture species.

Research is in progress on more than 470 projects seeking solutions to infectious diseases or parasitic problems of food animals and horses. Strong emphasis is being placed on solution to respiratory, enteric, and reproductive diseases. Other major problems such as mastitis, pseudorabies, pinkeye, internal parasites, and toxicoses are being investigated. New or improved methods are being developed to control these diseases and other high priority problems such as shipping fever, salmonellosis, bluetongue, and TGE. New biotechnology procedures including genetic engineering, monoclonal antibody, virus fingerprinting, and subunit immunization are being employed to accelerate needed breakthroughs in diagnosis and prevention of animal pathogens.

Table 2 is a summary of research funding by disease category within each commodity in FY 1986 as provided by the Section 1433 Program.

Table 3 provides data on the amount of Section 1433 funds that have been received by individual institutions, 1980-1986.

## 2. Section 1414(c)(1), Special Research Grants in Animal Health

Animal health research under the Special Research Grant Program has placed emphasis on the solution of problems of highest priority and national importance. Grants of up to \$150,000 currently are made for funded projects--permitting in-depth studies by some of the Nation's most highly trained, experienced and productive animal health scientists. Projects are funded with a single grant and expenditures are permitted over a period of up to 5 years depending upon budgets and work plans as presented in the proposal. This Program is administered by the Cooperative State Research Service.

Eligible diseases and their priorities are identified annually by the Animal Health Science Research Advisory Board through recommendations from national livestock and poultry commodity organizations and other groups concerned with animal health. A competitive process with peer panel evaluation of proposals has been used in the placement of the majority of grants made under this Program.

During the eight years of competition in Animal Health Special Research Grants (1979-1986) there has been a total submission of 3,721 proposals requesting over \$436 million; 552 proposals have received awards totaling \$52,987,589. Table 4 provides a summary of the awards listed by commodity and diseases. Data for 1979 include \$505,756 of Special Research Grant funds awarded noncompetitively to 17 State Agricultural Experiment Stations as Supplementary Research Grants.

The Board reviewed the animal health priority lists submitted for its consideration by the principal national livestock commodity and veterinary medical organizations and USDA recommendations. The Board then developed new guidelines for animal health research priorities that were recommended to CSRS for the Animal Health Special Grants Program for 1987.

The Board recommended that the percentage of funds allocated for each commodity research category remain the same as in 1986, but that funds not be earmarked for specific subcategories under each commodity research category. The Board reviewed the specific eligible areas of inquiry under each commodity category of research and made the recommendations as in Table 6.

#### National Academy of Science Study of CSRS Animal Health Research Program

Dr. Charles Muscoplat of Molecular Genetics, Inc., Minnetonka, Minnesota, presented a summary of the report to the Advisory Board. He was chairman of the Committee on CSRS Animal Health Research Programs, representing the Board on Agriculture of the National Academy of Science (NAS). The project was approved by the Governing Board of the National Research Council, which consists of members from the National Academy of Science, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competencies and with regard for appropriate balance. Appendix 1 provides the summary of the committee's report.

#### Report From Council on Research, AVMA

Dr. Sorensen reported for the Council and, as agreed at the Board meeting in 1984, provided a list of recommended research priorities by various commodity groups and professional organizations. A compilation of these priorities was presented and is included in Table 6.



### Competitive Research Grants Program (CRGP)

Dr. Cremer reported on activities in CRGP involving the competitive research programs in Animal Molecular Biology and Brucellosis, Growth and Development and Animal Science (reproductive physiology). CRGP received 1939 proposals in FY 86 of which, 342 were from the four animal programs listed above. Approximately 40 percent of the projects had animal health implications. For all CRGP programs combined, a total of \$44.4 million was awarded through 434 grants, an average of slightly over \$100,000 each. Awards ranged from \$25,000 for one year to nearly \$300,000 for three years. Success rates on submitted proposals ranged from 15 percent to 30 percent, depending on program area and budget availability while success rate based on requested funds was less than 10 percent. Those receiving awards received, on the average, one-half of the amount requested. Nearly 70 percent of the molecular biology program budget was awarded to support research with animal health implications in the areas of virology, bacteriology, parasitology and immunology. Several projects supported from the growth and development program contained health related research in the areas of immunology and endocrinology. There was a very close coordination between the CRGP and CSRS program staff to avoid duplicate funding of those projects which were meritorious in the Animal Health Special Research Grant Program.

### FDA Minor Use Animal Drugs

Dr. Norris Alderson of Beltsville, Maryland, gave the report from the Center for Veterinary Medicine, FDA. He reviewed the 1985 activities regarding their participation with the IR-4 program in Minor Species. The Gramm-Rudman budget action in 1986 reduced their extramural funds by 50 percent in the Minor Species research program in development of a data base for users of this information. Approximately \$400,000 went to the 1986 program. It is projected that approximately the same amount will be available in 1987. The minor species effort will then be phased down by the end of fiscal year 1987. Increased emphasis will be placed upon Methods Development for Detection of Drugs and Chemicals used in Feeds. In 1986 this program received \$115,000 for extramural funding. In 1987 approximately \$400,000 will be available. The inhouse research program located at Beltsville, Maryland, includes three to six scientists. This program is anticipated to continue at about the current level.

### Minor Use Animal Drugs - IR-4 Research Program

While annual gross income from minor animal species exceeds \$800 million, Food and Drug Administration approval of drugs for use in these species, and for minor uses in the major animal species has been greatly hampered by regulatory requirements and costs of drug development. Animals categorized as minor species include sheep, goats, rabbits, ducks, aquatic species and game birds.

In 1982, Interregional Research Project No. 4 (IR-4) was revised to include a means to obtain FDA clearance of animal drugs intended for minor uses. The 1982-1985 annual support through Special Research Grants of \$240,000 and \$229,000 in Fiscal Year 1986 has permitted the program to be initiated. This level of funding is very inadequate to meet the requests for further clearances from the affected industries.



Special Research Grant funds are divided equally between the four IR-4 regional leader laboratories located in New York (Cornell), Michigan, Florida, and California and IR-4 Headquarters at Rutgers University. These funds are being utilized in drug aspects of program at the leader laboratories and are also allocated to State Agricultural Experiment Stations to develop data required for meeting clearance requirements. The overall research component of the IR-4 program consists of the SAES, ARS, schools of veterinary medicine, the drug industry and the efforts of these leader laboratories.

Cooperation from the pharmaceutical industry and the coordination and support of the Center for Veterinary Medicine of the Food and Drug Administration to obtain these clearances has been exceptional. This is a prime example of interagency cooperation together with industry and commodity interests to effectively meet an urgent need. The legal and safe use of drugs for prevention and treatment of disease in the numerous species involved cannot occur until needed drugs are cleared for use. Thus, the program is essential for both the producer and consumer.

To date, 137 drug requests have been submitted to IR-4 for clearance. Working in conjunction with 14 universities, the USDI Fish and Wildlife Service, ARS and 13 pharmaceutical companies, 25 research projects have been initiated and will be continued through 1986 to establish data for clearances. Five clearances have been obtained with a number of others pending approval.

TABLE 1

<u>Item</u>	<u>FY 1979</u>	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>FY 1983</u>	<u>FY 1984</u>	<u>FY 1985</u>	<u>FY 1986</u>
Formula Funds	5,000	6,000	6,500	5,760	5,760	5,760	5,760	5,191
(Sec. 1433)								
Spec. Research Grants								
Animal Health	10,000	7,000	5,050	7,156	7,156	7,156	6,000	5,408
Minor Use Animal Drugs	----	----	---	240	240	240	240	229
Total	15,000	13,000	11,550	13,156	13,156	13,156	12,000	10,828



TABLE 2

**Animal Health and Disease Formula Research Program**  
**Summary of Research Fund Support Utilization**  
**By All Eligible Institutions of FY 1986**

Disease Category	COMMODITIES							
	Cattle	Swine	Poultry	Sheep	Goats	Horses	Aquaculture	Multi-species
Respiratory Diseases	306,441	95,619	79,912	9,415	-0-	47,440	2,701	-0-
Intestinal Diseases	640,697	141,344	91,380	11,600	-0-	40,662	-0-	-0-
Reproductive Diseases	429,624	132,735	12,677	40,597	9,299	40,558	-0-	-0-
Neurologic Diseases	36,181	-0-	-0-	15,158	-0-	36,255	-0-	-0-
Cardiovascular and Hemic Diseases	86,415	31,911	-0-	-0-	-0-	76,342	-0-	-0-
Dermatologic Diseases	6,845	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Musculo-skeletal Diseases	28,208	32,199	20,203	10,637	2,586	127,852	-0-	-0-
Urologic Diseases	19,690	-0-	-0-	-0-	-0-	2,901	14,024	-0-
Immunologic Diseases	509,402	69,099	136,966	34,545	-0-	14,202	15,956	-0-
Eye Diseases	64,685	-0-	-0-	-0-	-0-	2,901	-0-	-0-
Generalized Infectious Diseases	162,818	47,703	34,083	39,597	10,989	66,070	56,036	-0-
Metabolic/Nutritional Diseases	216,661	8,665	21,840	-0-	-0-	967	-0-	-0-
Toxic Diseases	223,010	19,997	16,094	3,595	2,418	-0-	-0-	-0-
Internal Parasitic Diseases	60,881	23,897	10,637	33,626	-0-	-0-	-0-	-0-
External Parasitic Diseases	120,007	-0-	-0-	10,131	-0-	967	-0-	-0-
Leoplastic Diseases	41,675	-0-	3,868	-0-	-0-	-0-	-0-	-0-
Vaginitis	204,266	-0-	-0-	-0-	-0-	4,835	-0-	-0-
Therapy of Diseases	41,628	-0-	15,472	3,868	-0-	-0-	-0-	-0-
Other Diseases	29,500	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Total	3,228,634	603,169	443,141	212,769	25,292	461,952	88,717	237,868
								5,301,542

Table 3  
Animal Health (Section 1433) Fund Allocations  
FY 1980 to 1986

AES = Agricultural Experiment Station  
SVM = Schools and Colleges of Veterinary Medicine  
\* = AES and SVM combined

	1980	1981	1982	1983	1984	1985	1986
<b>ALABAMA</b>							
AES, Auburn University	\$104,005	\$108,063	\$89,645	\$88,463	\$84,301	\$86,828	\$ 75,960
SVM, Auburn University	\$27,320	\$23,668	\$21,560	\$21,006	\$22,391	\$29,764	\$ 32,714
SVM, Tuskegee Institute	\$24,325	\$26,886	\$20,435	\$21,103	\$16,454	\$10,998	\$ 5,932
<b>ALASKA</b>							
AES, University of Alaska	\$9,602	\$11,589	\$12,503	\$15,053	\$13,924	\$9,318	\$8,930
<b>ARIZONA</b>							
AES, University of Arizona	\$66,874	\$73,426	\$60,007	\$59,239	\$54,686	\$57,164	\$56,615
<b>ARKANSAS</b>							
AES, University of Arkansas	\$83,340	\$91,359	\$81,957	\$81,621	\$79,001	\$78,085	\$72,216
<b>CALIFORNIA</b>							
AES, U. of California, Berkeley	\$218,204	\$232,257	\$203,790	\$212,367	\$226,345	\$245,028	\$235,486
SVM, U. of California, Davis	\$85,821	\$160,537	\$177,166	\$199,317	\$188,341	\$196,346	\$183,479
<b>COLORADO</b>							
AES, Colorado State Univ.	*232,980	*260,767	*276,285	*260,477	*262,454	*230,633	*250,439
SVM, Colorado State Univ.							
<b>CONNECTICUT</b>							
AES, U. of Connecticut, Storrs	\$16,840	\$17,924	\$20,041	\$22,256	\$24,065	\$23,806	\$22,348
<b>DELAWARE</b>							
AES, University of Delaware	\$14,901	\$16,814	\$17,401	\$16,776	\$16,187	\$14,380	\$15,091
<b>FLORIDA</b>							
AES, University of Florida	\$94,598	\$98,792	\$82,307	\$81,509	\$79,028	\$82,885	\$77,199
SVM, University of Florida	\$14,011	\$15,811	\$15,821	\$23,915	\$34,538	\$49,013	\$59,707

	1980	1981	1982	1983	1984	1985	1986
GEORGIA							
AES, University of Georgia	\$46,979	\$49,398	\$40,281	\$37,903	\$33,989	\$29,647	\$22,818
SVM, University of Georgia	\$130,171	\$137,082	\$124,516	\$130,479	\$136,986	\$143,203	\$129,422
HAWAII							
AES, University of Hawaii	\$8,481	\$9,156	\$8,341	\$8,458	\$8,314	\$7,943	\$7,482
IDAHO							
AES, University of Idaho	\$73,323				\$71,230	\$64,687	\$53,990
SVM, University of Idaho	\$27,517	*104,670	*85,447	*82,667	\$13,487	\$15,638	\$19,085
ILLINOIS							
SVM, University of Illinois	*200,909	*200,150	*167,905	\$164,312	\$171,958	*179,934	\$169,195
INDIANA							
SVM, University of Indiana	*131,077	*141,379	*120,908	*123,647	*123,794	*123,252	\$109,865
IOWA							
AES, Iowa State University	\$35,405	\$42,338	\$51,691	\$64,009	\$70,018	\$67,881	\$59,179
SVM, Iowa State University	\$311,942	\$326,415	\$280,350	\$261,622	\$254,464	\$285,524	\$247,015
KANSAS							
SVM, University of Kansas	*194,993	*206,457	*185,103	*186,541	*190,193	*184,651	*172,068
KENTUCKY							
AES, University of Kentucky	\$107,071	\$109,265	\$93,303	\$98,340	\$98,166	\$98,092	\$92,813
LOUISIANA							
AES, Louisiana State Univ.	\$101,978	\$110,564	\$94,090	\$89,607	\$84,321	\$80,562	\$73,044
SVM, Louisiana State Univ.	\$11,489	\$15,512	\$17,501	\$25,013	\$30,105	\$30,042	\$25,012
MAINE							
AES, University of Maine	\$23,455	\$25,046	\$24,622	\$22,675	\$2,012	\$18,102	\$16,108
MARYLAND							
AES, University of Maryland	\$64,442	\$68,862	\$54,976	\$57,058	\$50,065	\$48,548	\$46,140
John Hopkins University	\$15,787	\$15,584	\$10,449	\$0	\$0	\$0	\$0

MASSACHUSETTS		1980	1981	1982	1983	1984	1985	1986
AES, Univ. of Massachusetts SVM, Tufts University		\$23,705	\$21,738	\$16,945	\$15,670	\$12,126	\$10,620	\$9,695
		\$0	\$28,052	\$36,068	\$36,849	\$56,192	\$51,016	\$43,757
MICHIGAN								
AES, Michigan State Univ. SVM, Michigan State Univ.		*148,301	\$91,319	\$68,783	*110,149	*107,814	*103,969	\$95,376
			\$51,366	\$47,294				
MINNESOTA								
AES, University of Minnesota SVM, University of Minnesota		\$81,970	\$84,055	\$76,364	\$70,268	\$74,718	\$82,115	\$84,221
		\$125,357	\$144,017	\$124,668	\$132,156	\$123,487	\$111,182	\$94,497
MISSISSIPPI								
AES, Mississippi State Univ.		*75,867	*81,045	*76,879	\$69,523	\$62,566	*52,007	\$50,876
MISSOURI								
AES, University of Missouri SVM, University of Missouri		\$75,175	\$66,293	\$45,869	\$42,073	\$61,934	\$73,452	\$54,115
		\$87,841	\$121,398	\$123,728	\$121,225	\$93,589	\$67,853	\$93,453
MONTANA								
AES, Montana State Univ.		\$106,421	\$111,624	\$89,650	\$83,889	\$77,041	\$77,156	\$78,952
NEBRASKA								
AES, Univ. of Nebraska		\$180,942	\$203,947	\$184,801	\$190,134	\$191,682	\$193,987	\$180,744
NEVADA								
AES, University of Nevada		\$30,751	\$30,547	\$23,947	\$21,672	\$18,647	\$17,365	\$17,280
NEW HAMPSHIRE								
AES, Univ. of New Hampshire		\$16,872	\$16,206	\$12,753	\$12,482	\$11,678	\$11,190	\$10,135
NEW JERSEY								
AES, Rutgers University		\$31,407	\$32,008	\$27,466	\$28,707	\$26,715	\$26,978	\$21,357
NEW MEXICO								
AES, New Mexico State Univ.		\$49,104	\$50,407	\$43,831	\$39,689	\$38,421	\$41,159	\$40,068
NEW YORK								
AES, Cornell University SVM, Cornell University		\$24,621	\$38,475	\$43,554	\$51,701	\$50,473	\$51,250	\$54,007
		\$203,053	\$223,216	\$188,889	\$199,730	\$206,594	\$221,233	\$212,026

	1980	1981	1982	1983	1984	1985	1986
NORTH CAROLINA							
AES, North Carolina State U.	*125,158	*126,026	*101,339	*97,640	*97,193	*100,061	*100,096
NORTH DAKOTA							
AES, North Dakota State U.	\$67,213	\$69,565	\$57,879	\$56,734	\$57,644	\$58,502	\$56,150
OHIO							
AES, Ohio State University	\$98,576	\$89,550	\$65,621	\$61,952	\$64,874	\$70,716	\$69,994
SVM, Ohio State University	\$51,921	\$60,966	\$69,974	\$70,324	\$70,147	\$53,379	\$46,557
OKLAHOMA							
AES, Oklahoma State Univ.	\$148,637	\$157,722					
SVM, Oklahoma State Univ.	\$6,145	\$5,066	*130,813	*129,962	*123,764	*125,298	\$111,228
OREGON							
AES, Oregon State University	\$58,795	\$66,998	\$63,963	\$68,444	\$62,117	\$53,015	\$47,354
SVM, Oregon State University	\$54,244	\$59,314	\$50,978	\$40,850	\$37,633	\$42,804	\$43,533
PENNSYLVANIA							
AES, Univ. of Pennsylvania	\$67,793	\$64,985	\$55,225	\$52,832	\$52,447	\$52,337	\$52,983
SVM, Univ. of Pennsylvania	\$74,501	\$97,406	\$105,426	\$117,555	\$119,287	\$108,886	\$95,497
Lehigh University	\$2,791	\$0	\$0	\$0	\$0	\$0	\$0
PUERTO RICO							
AES, Univ. of Puerto Rico	\$19,280	\$16,935	\$16,008	\$16,418	\$15,292	\$14,543	\$13,217
RHODE ISLAND							
AES, Univ. of Rhode Island	\$12,199	\$15,231	\$12,658	\$13,549	\$14,402	\$14,910	\$12,428
SOUTH CAROLINA							
AES, Clemson University	\$28,671	\$28,397	\$23,241	\$23,012	\$23,754	\$23,555	\$21,680
SOUTH DAKOTA							
AES, South Dakota State U.	\$118,702	\$125,871	\$109,615	\$105,878	\$101,127	\$96,112	\$88,582
TENNESSEE							
AES, Univ. of Tennessee	*73,301	*82,137	*73,990	*76,904	*74,629	*70,441	*62,737
SVM, Univ. of Tennessee							
TEXAS							
AES, Texas A&M University	*425,692	*436,027	*343,157	*319,658	*331,193	*346,564	*347,878
SVM, Texas A&M University							

	1980	1981	1982	1983	1984	1985	1986
UTAH							
AES, Utah State University	\$52,768	\$60,889	\$61,031	\$61,301	\$60,935	\$57,344	\$49,812
VERMONT							
AES, University of Vermont	\$19,305	\$19,674	\$17,148	\$18,253	\$18,977	\$18,298	\$16,664
VIRGINIA							
AES, VPI & SU	*85,377	*95,619	*86,636	*90,487	*84,512	*90,624	*83,696
SVM, VPI & SU							
WASHINGTON							
AES, Washington State Univ.	\$37,457	\$35,524	\$28,038	\$27,741	\$30,950	\$34,631	\$35,171
SVM, Washington State Univ.	\$94,349	\$115,483	\$110,128	\$115,258	\$111,666	\$116,010	\$104,469
WEST VIRGINIA							
AES, West Virginia Univ.	\$21,579	\$23,531	\$18,317	\$17,463	\$16,035	\$16,267	\$14,165
WISCONSIN							
AES, Univ. of Wisconsin	\$225,816	\$239,723	\$215,841				
SVM, Univ. of Wisconsin	\$0	\$0	\$0	*212,814	*213,497	*208,846	*196,921
WYOMING							
AES, Univ. of Wyoming	\$50,106	\$51,986	\$43,044	\$42,162	\$42,203	\$43,265	\$40,525
TOTAL	\$5,760,000	\$6,240,000	\$5,529,600	\$5,518,541	\$5,496,422	\$5,474,304	\$5,476,000



TABLE 4

ANIMAL HEALTH SPECIAL RESEARCH GRANTS AWARDS  
Fiscal Years 1979-1986

Commodity and Disease	1979-1983		1984		1985		1986		Total	
	Projects	Funds	Projects	Funds	Projects	Funds	Projects	Funds	Projects	Funds
<b>BEEF CATTLE</b>										
Respiratory Diseases	42	\$4,879,303	8	\$1,151,693	6	\$961,759	7	\$994,418	63	\$7,987,173
Reproductive Diseases (Including Anestrus)	20	\$2,510,747	6	\$760,770	5	\$599,505	4	\$466,692	35	\$4,337,714
Enteric Diseases	24	\$2,326,347	6	\$575,847	4	\$473,954	0	---	34	\$3,376,148
Metabolic Diseases	5	\$436,350	0	---	0	---	1	\$134,955	6	\$571,305
Toxicosis	5	\$456,162	0	---	0	---	0	---	5	\$456,162
Bluetongue	4	\$506,207	1	\$103,000	1	\$139,303	1	\$144,892	7	\$893,402
Internal Parasites	16	\$1,834,381	3	\$257,923	2	\$147,366	1	\$135,418	22	\$2,405,088
External Parasites	10	\$941,317	1	\$51,634	1	\$100,000	0	---	12	\$1,092,951
Other Diseases	2	\$100,920	0	---	0	---	0	---	2	\$100,920
<b>SUBTOTAL</b>	<b>128</b>	<b>\$13,991,734</b>	<b>25</b>	<b>\$2,930,867</b>	<b>19</b>	<b>\$2,421,887</b>	<b>14</b>	<b>\$1,876,375</b>	<b>186</b>	<b>\$21,220,863</b>

**ANIMAL HEALTH SPECIAL RESEARCH GRANTS AWARDS**

**Fiscal Years 1979-1986**

<u>Commodity and Disease</u>	<u>1979-1983</u>		<u>1984</u>		<u>1985</u>		<u>1986</u>		<u>Total</u>	
	<u>Projects</u>	<u>Funds</u>	<u>Projects</u>	<u>Funds</u>	<u>Projects</u>	<u>Funds</u>	<u>Projects</u>	<u>Funds</u>	<u>Projects</u>	<u>Funds</u>
<b>DAIRY CATTLE</b>										
Mastitis	27	\$2,132,133	5	\$441,200	4	\$368,439	3	\$320,916	39	\$3,262,688
Respiratory Diseases	8	\$679,598	2	\$189,085	2	\$157,902	1	\$87,250	13	\$1,113,835
Reproductive Diseases (including Anestrus)	18	\$1,912,892	4	\$378,171	2	\$298,316	2	\$300,000	26	\$2,889,379
Enteric Diseases	8	\$543,682	1	\$126,057	2	\$210,536	4	\$454,404	15	\$1,334,679
Metabolic Diseases	6	\$502,805	0	---	0	---	1	\$144,142	7	\$646,947
Bluetongue	1	\$132,414	0	---	0	---	0	---	1	\$132,414
Internal Parasites	2	\$73,245	0	---	0	---	0	---	2	\$73,245
External Parasites	1	\$58,500	0	---	0	---	0	---	1	\$58,500
Other Diseases	3	\$309,837	1	\$74,423	0	---	0	---	4	\$384,260
<b>SUBTOTAL</b>	<b>74</b>	<b>\$6,345,106</b>	<b>13</b>	<b>\$1,208,936</b>	<b>10</b>	<b>\$1,035,193</b>	<b>11</b>	<b>\$1,306,712</b>	<b>108</b>	<b>\$9,895,947</b>



ANIMAL HEALTH SPECIAL RESEARCH GRANTS AWARDS  
Fiscal Years 1979-1986

Commodity and Disease	1979-1983		1984		1985		1986		Total	
	Projects	Funds	Projects	Funds	Projects	Funds	Projects	Funds	Projects	Funds
SWINE										
Enteric Diseases	26	2,015,639	3	316,350	3	221,456	4	315,021	36	2,868,466
Respiratory Diseases	10	963,498	3	316,350	2	225,455	2	270,417	17	1,775,720
Reproductive Diseases	5	541,256	3	248,735	1	131,389	1	91,600	10	1,012,980
Pseudorabies	5	668,174	0	---	2	267,071	1	149,464	8	1,084,709
MMA	7	528,862	1	98,851	0	---	1	150,000	9	777,713
Internal Parasites	6	489,663	0	---	2	153,337	0	---	8	643,000
External Parasites	2	187,980	0	---	0	---	0	---	2	187,980
Toxicosis	3	268,843	4	285,114	1	58,006	0	---	8	611,963
Skeletal Diseases (Lameness)	4	320,386	0	---	0	---	0	---	4	320,386
SUBTOTAL	68	\$5,984,301	14	\$1,265,400	11	\$1,056,714	9	\$976,502	102	\$9,282,917

ANIMAL HEALTH SPECIAL RESEARCH GRANTS AWARDS  
Fiscal Years 1979-1986

Commodity and Disease	1979-1983		1984		1985		1986		Total	
	Projects	Funds	Projects	Funds	Projects	Funds	Projects	Funds	Projects	Funds
<b>POULTRY</b>										
Respiratory Diseases	32	\$2,193,623	4	\$352,358	4	\$356,656	4	\$270,417	44	\$3,173,054
Skeletal Diseases	5	\$573,349	0	---	0	---	1	\$102,142	6	\$675,491
Enteric Diseases	8	\$585,388	1	\$90,741	1	\$74,230	2	\$159,250	12	\$909,609
Neoplastic Diseases (Incl. Marek's Dis.)	5	\$264,636	1	\$144,666	0	---	1	\$75,000	7	\$484,302
Internal Parasites	3	\$337,350	0	---	1	\$68,432	0	---	4	\$405,782
Toxicosis	4	\$355,428	0	---	0	---	0	---	4	\$344,428
Other Diseases	1	\$113,410	2	\$266,414	2	\$213,993	1	\$93,275	6	\$687,092
	-----		-----		-----		-----		-----	
SUBTOTAL	58	\$4,423,184	8	\$854,179	8	\$713,311	9	\$700,084	83	\$6,690,758

ANIMAL HEALTH SPECIAL RESEARCH GRANTS AWARDS  
Fiscal Years 1979-1986

Commodity and Disease	1979-1983		1984		1985		1986		Total	
	Projects	Funds	Projects	Funds	Projects	Funds	Projects	Funds	Projects	Funds
SHEEP & GOATS										
Respiratory Diseases	2	\$209,281	1	\$77,145	0	---	0	---	3	\$286,426
Predator Control	6	\$382,404	0	---	0	---	0	---	6	\$382,404
Reproductive Diseases	3	\$129,920	1	\$121,000	0	---	0	---	4	\$250,920
Bluetongue	2	\$160,000	1	\$122,000	1	\$120,316	0	---	4	\$402,316
Caseous Lymphadenitis	3	\$244,337	0	---	1	\$147,031	0	---	4	\$391,368
Contagious Ecthyma	1	\$147,063	0	---	0	---	0	---	1	\$147,063
Internal Parasites	6	\$480,056	0	---	0	---	0	---	6	\$480,056
Other Diseases	4	\$192,368	0	---	0	---	2	\$270,417	6	\$462,785
	<hr/>		<hr/>		<hr/>		<hr/>		<hr/>	
SUBTOTAL	27	\$1,945,429	3	\$320,145	2	\$267,347	2	\$270,417	34	\$2,803,338

ANIMAL HEALTH SPECIAL RESEARCH GRANTS AWARDS  
Fiscal Years 1979-1986

Commodity and Disease	1979-1983		1984		1985		1986		Total	
	Projects	Funds	Projects	Funds	Projects	Funds	Projects	Funds	Projects	Funds
<b>HORSES</b>										
Respiratory Diseases	8	\$576,486	1	\$64,999	1	\$105,000	1	\$107,205	11	\$746,485
Enteric Diseases	2	\$158,255	0	---	1	\$73,040	0	---	3	\$231,295
Musculoskeletal Diseases	3	\$317,799	1	\$148,201	0	---	0	---	4	\$466,000
Internal Diseases	2	\$229,270	0	---	0	---	1	\$55,045	3	\$229,270
	-----		-----		-----		-----		-----	
SUBTOTAL	15	\$1,281,810	2	\$213,200	2	\$178,040	2	\$162,250	21	\$1,673,050

ANIMAL HEALTH SPECIAL RESEARCH GRANTS AWARDS  
Fiscal Years 1979-1986

<u>Commodity and Disease</u>	<u>1979-1983</u>		<u>1984</u>		<u>1985</u>		<u>1986</u>		<u>Total</u>	
	<u>Projects</u>	<u>Funds</u>	<u>Projects</u>	<u>Funds</u>	<u>Projects</u>	<u>Funds</u>	<u>Projects</u>	<u>Funds</u>	<u>Projects</u>	<u>Funds</u>
AQUACULTURE										
Infectious Diseases	9	\$774,927	2	\$106,945	2	\$89,308	3	\$108,167	16	\$971,180
Parasites	2	\$170,777	0	---	0	---	0	---	2	\$170,777
	<u>-----</u>		<u>-----</u>		<u>-----</u>		<u>-----</u>		<u>-----</u>	
SUBTOTAL	11	\$945,704	2	\$106,945	2	\$89,308	3	\$108,167	18	\$1,141,957
TOTAL RESEARCH										
FOR ALL COMMODITIES -	370	\$34,917,777	67	\$6,899,672	54	\$5,761,800	51	\$5,408,340	552	\$52,987,589

ANIMAL HEALTH SPECIAL RESEARCH GRANTS  
FISCAL YEAR 1986

AREA	NUMBER OF PROPOSALS		PROPOSALS FUNDED	SUCCESS RATE	AMOUNT	
	PROPOSALS				REQUESTED	AMOUNT GRANTED
<b>BEEF AND DAIRY CATTLE</b>						
Reproductive Diseases	46		7	15%	6,227,240	\$ 919,417
						Beef 656,073 Dairy 263,344
Respiratory Diseases	46		8	17%	6,449,029	1,081,668
						Beef 919,418 Dairy 162,250
Mastitis	20		3	15%	2,516,726	324,500
Enteric and Digestive Diseases	21		5	24%	2,555,625	540,834
						Beef 430,846 Dairy 109,988
Parasitic and Metabolic Diseases	31		2	6%	4,342,182	216,334
						Beef 216,334
Johnes Disease	11		2	18%	1,425,866	108,167
<b>Swine</b>						
Enteric Diseases	21		4	19%	2,417,978	315,021
Respiratory Diseases	16		2	13%	2,047,332	270,417
Reproductive Diseases	6		1	17%	688,683	150,000
Other Swine Diseases	17		2	12%	1,920,920	238,064
<b>Poultry</b>						
Respiratory Diseases	31		4	13%	3,534,404	270,417
Metabolic and Immunologic Diseases	16		3	15%	1,915,068	270,417
Enteric Disorders	8		2	25%	1,034,023	162,250
<b>Sheep and Goats</b>						
	22		2	9%	2,648,800	270,417
<b>Horses</b>						
	21		2	10%	2,278,701	162,250
<b>Aquaculture</b>						
	4		2*	50%	263,330	108,167
TOTAL	337		51	15%	42,265,907	5,408,340

\*One proposal partially funded by Animal Health and Aquaculture funds

Table 6

Specific Commodity Areas and Appropriate Percentages  
Recommended for Funding in Special Grants

<u>COMMODITY</u>	<u>PERCENT OF FUNDS</u>
Beef Cattle	41.0 percent
1. Respiratory diseases	
2. Reproductive diseases	
3. Digestive and enteric diseases	
4. Parasitic diseases	
5. Metabolic diseases with no specific diseases identified as high priorities	
Dairy Cattle	18.0 percent
1. Mastitis	
2. Reproductive diseases	
3. Respiratory diseases	
4. Digestive and enteric diseases	
5. Metabolic diseases with no specific diseases identified as high priorities	
Swine	18.0 percent
1. Enteric diseases	
2. Respiratory diseases	
3. Reproductive diseases	
4. Metabolic and musculoskeletal disease	
5. Parasitic diseases	
Poultry	13.0 percent
1. Respiratory diseases	
2. Metabolic and immunologic diseases	
3. Enteric diseases	
4. Skeletal diseases	
Sheep and Goats	5.0 percent
1. Musculoskeletal diseases	
2. Respiratory diseases	
3. Digestive and enteric diseases	
4. Internal parasitic diseases with no specific diseases identified as high priorities	
Horses	3.0 percent
1. Respiratory diseases	
2. Digestive and enteric diseases	
3. Reproductive diseases	
4. Musculoskeletal diseases with no specific diseases identified as high priority	
Aquaculture	2.0 percent
1. Infectious diseases	
2. Parasitic diseases	

Table 7

SUMMARY OF ANIMAL HEALTH AND DISEASE RESEARCH PRIORITIES

Organizations representing all of the commodities have developed animal disease research priorities for each commodity as determined by selected organizations.

Beef Cattle Health Research Needs

National Cattlemen's Association (1986)

1. Disease predisposition and alteration of basic cellular physiology as affected by:
  - a. Nutritional factors
  - b. Genetic factors
  - c. Environmental factors
  - d. Infectious agents
  - e. Immunological factors
2. Current visible disease priorities (determined annually)
3. Sub-clinical Disease - The ability to recognize their existence and effect on performance
4. Diagnostic capabilities, interpretation, and standardization of methodology to stimulate the development of diagnostic systems for animals, environments, feedstuffs, and infective agents.
5. Include immune enhancement as an integral part of all research
6. Develop a national computerized model of epidemiology to link cattle diseases and production economics

North Central Advisory Committee (NCA-2) (1986)

1. Respiratory Diseases
2. Enteric diseases
3. Reproductive diseases
4. Infectious keratoconjunctivitis (pinkeye)
5. Infectious pododermatitis (foot rot)
6. Parasitic diseases
7. Environmental and toxic diseases
8. Encephalitic diseases
9. Clostridial diseases

Dairy Health Research Needs

Presented by Robert Kindig, Conestoga, Pennsylvania

Production efficiency research, including health research, cannot relax even though production efficiency currently out-strips the dairy industry's efficiency in marketing its product. The long "lead-time" from research initiation to farm adoption of new techniques means the American economy must continue to develop new and better technology. Consumers are the ultimate beneficiaries. Dairy farmers believe maximum productive efficiency should



continue to be encouraged for the health of the dairy industry and the American economy.

The dairy industry believes health research should focus on three specific areas of concern which are mastitis research, reproduction research, and Johne's Disease research.

### 1. Mastitis Research:

The following mastitis research needs were developed by the National Mastitis Council:

- a. Milking Equipment and Mastitis  
There are few reliable data defining characteristics of milking machines that influence incidence and severity of mastitis.
- b. The Dry Period and Mastitis  
New methods of treatment and prophylaxis in the dry period are needed.
- c. Specific Immunity and Immunization  
There is need for study of the mechanisms of immunity and potential effective vaccines.
- d. Non-Specific Resistance  
Resistance research areas include integrity of the teat canal barrier to infection, phagocytosis in the mammary gland and various antibacterial factors in milk and dry period secretions.
- e. Integrated Mastitis Control Program  
  
Development of integrated mastitis control systems requires validation of management practices which minimize the incidence of clinical mastitis, the level of subclinical infection and production loss.

### 2. Reproduction Research:

- a. Estrus detection
- b. Retained placenta
- c. Cystic ovaries
- d. Abortion-embryonic death

Other needs for reproduction research are:

- a. Reproductive disease (brucellosis, leptospirosis, vibriosis, low-grade infection, etc.)
- b. Semen processing and storage
- c. Environmental effects on reproduction (such as ambient temperature) and methods to minimize these effects.

### 3. Johne's Disease Research:

Johne's Disease recently has become a serious threat to dairy cattle. It is believed to affect 11-20% of all dairy animals in Wisconsin and Northeast United States. Between 15 and 35 percent of all herds probably have one or more animals infected with Johne's.

Fecal culture is the most reliable diagnostic test, but it also is the least convenient. Cultural identification takes from six weeks to 3-4 months. One of the major areas of current research is to develop a test that is as definitive as the fecal culture test but is much quicker.

#### North Central Advisory Committee (NCA-2) (1984)

1. Reproductive Diseases
2. Enteric and Johne's Disease
3. Mastitis
4. Digestive and metabolic diseases associated with high production and high energy rations
5. Musculo-skeletal diseases; arthritis and foot rot
6. Respiratory diseases including calf pneumonia
7. Leucosis

#### Swine Disease Research Needs

#### National Pork Producers Council

Presented by David Meeker (1986)

The National Pork Producers Council has developed research and education priorities for use throughout the pork industry. The priorities encompass pork production, health, and marketing. No special treatment was assigned financial or economic considerations, but pork producers unanimously agree that profit is their motivation for raising hogs. Therefore, there is concern for economic payback from any new technology utilized in the industry.

#### 1. Respiratory Diseases

Hemophilus pleuropneumonia  
Mycoplasma pneumonia  
Atrophic rhinitis  
Pasteurella multocida  
Swine influenza  
Pseudorabies  
Hemophilus parasuis

#### 2. Enteric Diseases

E. Coli diarrhea (low research priority)  
Clostridial infections  
TGE  
Other viral infections  
Thread worm  
Salmonella  
Swine dysentery  
Internal parasites (low research priority)  
Proliferative ileitis

### 3. Reproductive Diseases

- MMA
- Porcine parvovirus
- Leptospirosis
- Eperythrozoonosis
- Streptococcal infections

### 4. Other

- External parasites
- Lameness
- Economics (cost effectiveness)
- Immune Response
- PSS

### North Central Advisory Committee (NCA-2) 1984

1. Enteric diseases
2. Respiratory diseases
3. Psudorabies
4. Perinatal Mortality
5. Effects of environmental factors
6. Arthritis
7. Swine abscesses
8. Toxic diseases
9. Control measures for internal and external parasites

### Poultry Disease Research Needs

#### Broilers:

#### National Broiler Federation (1984-85)

1. Respiratory Diseases
2. Improved diagnostic procedures for all diseases
3. Hemorrhagic syndrome

#### Poultry and Egg Institute of America (1983-84)

1. Immunology--basic research to improve efficacy of vaccination
2. Leg problems
3. Mycotoxin -- development of more rapid and accurate tests for identification and quantification of mycotoxins in tissues and feeds

#### North Central Advisory Committee (NCA-2) (1984)

1. Respiratory Diseases
2. Immunologic Disorders
3. Enteric Diseases
4. Leg Disorders
5. Bacterial septicemias
6. Reproductive Diseases
7. Transmissible tumors

Turkeys:

National Turkey Federation (1984)

1. Respiratory Infections
  - Colibacillosis
  - Aspergillosis
  - Avian influenza
  - Paramyxovirus infections
2. Enteric Disorders
  - Viral enteritis
1. Other Respiratory Infections
  - Turkey coryza syndrome
  - Mycoplasmosis
  - Chlamydiosis
4. Other Enteric Disorders
  - Salmonellosis - Arizonosis
  - Hemorrhagic enteritis
  - Coccidiosis
  - Mycosis
  - Mycotoxicosis
5. Skeletal Problems
  - Osteomyelitis
  - Tibial dyschondroplasia
  - Nutritional and non-infectious musculo-skeletal problems
  - Mycoplasmosis
  - Tibial rotation
  - Vertebral fractures
6. Immune Diseases
  - Infectious bursal disease
  - Mycotoxicosis
7. Systemic Infections
  - Erysipelas
  - Transmissible neoplasms
  - Turkey virus hepatitis
8. Miscellaneous
  - Roundheart
  - Aneurysm
  - Leg edema
  - Muscle dystrophy
  - Interaction between genetics and environment on disease resistance
  - Drugs/chemical residues
  - Reproductive diseases
  - Encephalomalacia
9. Parasitic Problems
  - External parasites
  - Internal parasites

## Sheep Diseases Research Needs

## American Sheep Industry (1983)

1. Bluetongue disease - diagnosis and control
2. Foot rot " "
3. Pulmonary/resp. diseases " "
4. Polyarthritis " "
5. Maintain the IR-4 program for registering drugs for use in minor species

National Wool Growers Association, Inc. (1985)

1. Foot Rot
2. Bluetongue

National Central Advisory Committee (NCA-2) (1984)

1. Respiratory diseases
2. Internal parasites
3. Enteric diseases
4. Reproductive diseases
5. Environmental, metabolic and toxic diseases
6. Foot Rot

## Goat Diseases

North Central Advisory Committee (NCA-2) (1984)

1. Reproductive diseases
2. Mastitis
3. Enteric diseases
4. Caprine arthritic encephalitis
5. Foot rot
6. Caseous lymphadenitis

## Horse Diseases

North Central Advisory Committee (NCA-2) (1984)

1. Respiratory diseases
2. Musculoskeletal diseases
3. Reproductive diseases
4. Digestive diseases
5. Internal parasites

National Academy of Science Study of CSRS  
Animal Health Research Programs

CSRS ANIMAL HEALTH RESEARCH PROGRAMS: A CRITICAL EVALUATION

Each of the CSRS animal health research programs was initiated for different purposes, under varying circumstances, and at different times in history. However, despite their diverse origins, each of these programs addresses a distinct need in the total animal health research picture and the overall CSRS program functions in an unexpectedly efficient manner, addressing national and local needs in a well-integrated program. Therefore, CSRS funding is an efficient use of federal research dollars. However, there are several areas that need attention in order to strengthen the role of CSRS in animal health research.

Overall Mission and Planning. The committee believes that the CSRS animal health research programs lack strong overall mission, goals, and objectives. A more thorough and coordinated planning process, combined with the establishment of long-range plans, is needed to clearly define program goals and objectives. Criteria to evaluate research productivity need to be developed so that assessment procedures and site visits can measure the progress made toward fulfilling these goals and objectives. The program plans must be communicated through a constituency education program to elicit and maintain the support of the various self-interest groups that have supported the program in the past.

CSRS Animal Health Research Programs. Animal Health and Disease Research Program: Section 1433. The committee investigations revealed a clear consensus in the animal health and disease research community that Section 1433 formula funds are needed, appreciated, and well used. These funds are not redundant with other sources of funds, but rather are complementary. Formula funds fill a definite, well-defined niche in the overall network of funds available for animal health and disease research. Several distinct factors underscore this utility.

Formula funds are distributed on a formula basis to institutions. This allows institutions some latitude in planning budgets and directing research and training programs. This also allows institutions to obtain equipment necessary to develop new research capabilities, to improve laboratory facilities, to provide "seed" money for young scientists, and to support research on local problems.

Section 1433 formula funds are committed expressly to animal health and disease research. Commitment of funds allows institutions to train graduate students for careers in animal health research and to fund productive research and not to cover operational expenses or institutional overhead.



Formula funds represent an excellent investment of the federal research dollar. Virtually all of allocated funds go directly to financing the research project. Furthermore, provisions in the original legislation that authorized formula funds called for states that received \$100,000 or more of these monies to match these amounts with state appropriated dollars designated specifically for animal health research.

The trend toward peer-reviewed competitive grant allocation of formula funds promotes research excellence. Institutions are increasingly awarding money to researchers on the basis of intramural, peer-reviewed evaluation of scientific merit.

The committee identified several points that undermined the effectiveness of formula funds. First, the funding levels are inadequate to maximize the potential benefits of the program. Despite increasing numbers of veterinary colleges, animal disease researchers, and potential graduate students, as well as the ever increasing costs of doing research, the amount of available formula funds has remained static for the last 3 years. Second, annual funding is uncertain and therefore does not allow for efficient long-range planning. The Section 1433 program has not been included in the original USDA budget submitted to Congress and has only been included and approved later on in the course of budgetary debate and compromise. Administrators are unable to undertake long-range planning of research programs based on formula funds when these funds appear to be in annual jeopardy. Third, current methods of dispensing funds promote inefficiency and impair productivity. Two important factors contribute to this problem: (1) annual delay in congressional approval of formula funds, and (2) the federal requirement that all funds allocated in a specific year be expended or returned by the end of the federal fiscal year. This system encourages inappropriate or unwise expenditure of funds each year as the end of the fiscal year approaches.

Special Research Grants Program. The Special Research Grants Program provides a focus for innovative and contemporary approaches to fundamental problems in animal health. This has happened despite the very modest funding levels assigned to it and correspondingly frail administrative system. The program has adhered to the intent of the 1977 amendment to P.L. 89-106. It has established processes to assure research priority selection and balance, and for peer review of proposals. The resulting research output has been of a quality and quantity that more than justifies the hopes of the legislation. Accomplishments of the program are discussed in the text of the report.

This committee's review of the Animal Health Science Research Advisory Board annual reports shows that a mechanism has been set in place to facilitate expert assessment of species/commodity-based priorities for research. While it may now be time to broaden the scope of scientific input into the advisory process, the board's funding decisions over the past 6 years have fairly represented the opinions on disease priority areas within each species sector and the contributions of each commodity to livestock production as a whole.

The committee's survey of project titles, objectives, and approaches was by necessity incomplete and biased because of the more ready availability of information from the universities with which committee members were affiliated. Nevertheless, clear trends showed that research focused on the most important disease problems in each species, in many cases using appropriate contemporary technology and addressing questions fundamental to an understanding of disease

processes and therapeutic strategies. Some more conventional but not unimaginative projects have also been supported; in certain cases, research was constrained by lack of facilities and equipment.

There is ample evidence that projects funded by Special Research Grants draw on additional and complementary support at each institution. Project personnel take advantage of links within and between institutions, and projects frequently involve cross-disciplinary collaborations. These collaborations sometimes reach between universities and experiment stations, and occasionally to USDA laboratories. Such connections are not always easy to trace, but their advantages should not be overlooked where scarce resources need to be effectively deployed.

Researchers have not been required to identify Special Research Grants support in their publications, and so the program's productivity may be underrecognized; this contributes to the difficulty in evaluating the program.

It is expensive to involve professionally qualified scientists and implement experimental systems with livestock. Thus, the quality of research is constrained by the current budget ceiling on awards.

Administration. Effective operation of the CSRS animal health programs depends on the availability of an adequately funded and staffed administrative unit. Administrative units are needed to administer grant funds, to coordinate research grant peer reviews and formula funds allocation, to monitor and review progress of research through evaluation of publications and by site visits, to coordinate efforts among agencies where appropriate, to recommend changes in direction or in magnitude of funding, and to provide interested parties and Congress with information about the programs. Because of the lack of staff, there has been no time available to review Section 1433 projects critically. The use of peer review panels to review research proposals for funding under the Special Research Grants Program is critical to the program's success. Selection of peer panel members and the operation of the review process has been carried out carefully. However, panel members tend to be selected from a small pool of scientists. Peer review panels should have representation from both the public and private sectors. A file of qualified scientists in each animal health discipline should be maintained by the administrator of CSRS.

Panel members have voluntarily assumed enormous workloads and great responsibility, dealing with very large numbers of proposals each year.

Another weakness in the CSRS animal health research programs is the great diversity in the use and management of Hatch, Section 1433, and Special Research Grants funds at various research locations.

Futhermore, the committee could not determine from the Animal Health Science Research Advisory Board public reports what long-term impacts may have resulted from funded projects or whether solid scientific reports had been assembled.

Research administrators as well as the committee are concerned about the unpredictability of Section 1433 funding. The uncertainty of funding from year to year has made national research management and planning difficult for both researchers and administrators. Another concern is the \$150,000 limit placed on individual Special Research Grants for up to 5 years duration. Experts believe



that this limit tends to diminish both the quality and quantity of research conducted. A higher ceiling would allow more in-depth and longer-term investigation, thereby increasing research productivity and efficiency.

#### SETTING RESEARCH PRIORITIES

As a first step in setting research priorities, an overall plan is necessary that clearly sets long-range goals for animal health research. Such goals must be derived from an objective and quantitative analysis of the real needs in animal agriculture. Thus, a certain percentage of research should be devoted to determining the economic and social impact of animal diseases, and the Animal Health Science Research Advisory Board needs access to advice in these areas. Ad hoc members with expertise in quantitative measurements of animal disease costs, epidemiology, disease reporting, agricultural economics, and related fields should be appointed to the board.

Research priorities set by the Animal Health Science Research Advisory Board have changed little over the years, and they tend to be narrowly focused. New methods suggest that subclinical health problems are of greater importance than commonly perceived.

Today, new and powerful tools are available that can revolutionize the researcher's ability to help improve the efficiency of production in animal agriculture, and thus restore profitability in place of government subsidies such as in the dairy industry. The new technologies of greatest potential are computer-based information and decision support systems, and molecular biology.

Since basic knowledge of the pathogenesis of animal diseases is often the same in the various species of livestock, the committee suggests that a system approach using multidisciplinary research that cuts across commodity lines is necessary. The committee also suggests that priority research is needed to investigate (1) environmental factors affecting animal health and productivity, and behavior as a determinant of animal disease and production efficiency; and (2) integrated health management systems that consider farm management, nutrition, and the economics of livestock production.

#### RECOMMENDATIONS

In reviewing the animal health research in CSRS, the committee noted the complementary nature of the programs and the many strengths in management and activities. But the committee also noted weaknesses that reduce the effectiveness and productivity of the CSRS-sponsored efforts. The following recommendations were prepared to help CSRS develop stronger and more efficient animal health research programs, and thus help solve disease problems that threaten livestock agriculture in the United States. While the committee urges appropriation of additional financial support, many of its recommendations relate to planning, management, and administrative procedures.

Funding for Animal Health Research - The accomplishments of the special Research Grants and Section 1433 programs fully justify; the recommendation that USDA, the Office of Management and Budget, the Office of Science and Technology Policy, and Congress, by joint action, continue to expand these two programs. There are critical, current needs and opportunities in animal health research

that can best be assessed by the CSRS system through provision of a continuing, strong, stable institutional funding base, and through growth of the nationally competitive Special Research Grants Program.

Funding levels for the Special Research Grants Program must be increased to the original level allocated, \$10 million, with annual increases to reflect inflation costs for doing research. The current \$150,000 ceiling for individual grants should be raised to \$250,000.

The current level of funds appropriated for the Section 1433 Program must be increased over the next 5 years to reach the original allocation ceiling of \$25 million authorized by Congress.

Legislation should be enacted to allow use of Section 1433 funds to be carried over into the next fiscal year to permit some flexibility in research management.

The National and Regional Grants Program (Section 1434) should be funded at its authorized level.

CSRS must develop a comprehensive animal health research program plan that capitalizes on the uniqueness of the cooperative system and its capacity to draw upon the creative intellectual resources of state universities. Program objectives must project far enough ahead to ensure sustained attention to contemporary needs and priorities, but be responsive enough to address new concerns and incorporate new technologies as they arise.

Criteria need to be developed to evaluate the progress made toward fulfilling the research program objectives. Assessments of productivity and accountability are needed at regular intervals using established criteria.

To carry out its long-range plans, CSRS needs to better communicate animal health research needs, objectives, and accomplishments. At the present time, the Animal Health Science Research Advisory Board's Annual Report, which describes the animal health research programs and some of the accomplishments, is sent to the state agricultural experiment stations, colleges and schools of veterinary medicine, and commodity groups. A wider dissemination of information is necessary. Also, a constituency education program should be developed to elicit and maintain support from the various special interest groups and members of Congress that have supported the program in the past.

All the various agencies, departments, schools, and other groups with animal health programs need to facilitate collaborative programs and formulate an overall animal health plan.

Setting Research Priorities - CSRS must appoint several ad hoc members to the Animal Health Science Research Advisory Board whose combined expertise encompasses quantitative measurements of animal disease costs, epidemiology, statistical disease reporting, agricultural economics, technology assessment, basic computer models, and quantitative analytical systems for studying animal disease and its impact on productivity. Computer software development, as well as training to adapt it to animal disease situations, should receive a quantifying actual animal disease costs because this is the only way to prioritize animal health problems correctly and provide appropriate guidance to the advisory board.

To keep pace with new developments in animal health research, the following research areas should be eligible for funding in addition to the already established categories: (1) a systems approach to understanding disease mechanisms; (2) environmental factors affecting health and productivity, and behavior as a determinant of animal disease and production efficiency; and (3) integrated health management systems that include consideration of farm management, nutrition, and the economics of livestock production.

Administration. Funds and staff to administer Section 1433 and Special Research Grants programs must be substantially increased if CSRS is to carry out effectively its administrative responsibilities essential for high quality programs.

No program can be effective without support for its administration, and that requires adequate administrative funds and staff. To date, the administration of Section 1433 and Special Research Grants programs has been done admirably considering the limited available resources.

CSRS programs are a critical part of animal health research. Achieving excellence in such programs requires a highly organized, efficient, and respected administrative unit to coordinate all CSRS responsibilities. The administrative unit must have sufficient resources to carry out its mission. In the past, 4 percent of appropriated funds for the programs has been retained by the USDA to administer the programs. However, some of the money has been allocated to other administrative units within the USDA, so that the amount available for actual use for the CSRS scientific staff has been inadequate. More of these funds should be reserved for the professional staff.

CSRS should establish and maintain a file of qualified scientists willing to serve on peer review panels.

All state agricultural experiment stations and schools of veterinary medicine should maintain a file of research projects funded by CSRS animal health research programs and should be accountable for the accuracy of reports, funding sources, research productivity, and personnel trained.

All these eligible institutions depend heavily on the CRIS reporting system to do their bookkeeping and reporting on CSRS-funded research. This system appears to be inappropriate. CRIS can do a serviceable job of cataloging research titles and maintaining running accounts of dollar expenditures. However, CRIS provides very little detailed information to identify concrete accomplishments of CSRS-funded research, such as patentable discoveries, refereed publications, and graduate degrees awarded. It is essential that this type of information be collected by institutions receiving CSRS funds if the CSRS administration and eligible recipient institutions receiving CSRS funds if the CSRS administration and eligible recipient institutions are to compete effectively for continued support of animal health programs. An annual report including specific information from institutions receiving CSRS funds should be required.



The Commission on Veterinary Medicine analysis of the USDA budget reveals a great disparity between funding for animal agricultural and plant agricultural research. For example, in the FY 1986 ARS budget, proposed funding for plant sciences is \$188.6 million while that for animal sciences is \$88.2 million, or only 32 percent of the funds budgeted for these areas. The ratio of funding for plant sciences to that for animal sciences through the agricultural experiment stations is approximately 1.8/1.0. Based on 1983 data, farm income derived from livestock and their products was \$69.2 billion and that for crops was \$69.5 billion. Only about 6 percent of Hatch funding supports animal disease research. When these factors are considered along with the availability of a large pool of veterinary scientists interested in animal health and diseases research and with the magnitude of animal disease losses (\$14 billion), animal agricultural research funding should be increased significantly to bring it into a more equitable position with plant agricultural research and to address more effectively the needs of the agricultural community.

It is imperative that CSRS funding for animal health research be increased to authorized levels. The committee is overwhelmingly supportive of the Section 1433 formula program and the nationally competitive Special Research Grants Program. It is supportive of the Section 1433 program because (1) formula funds are committed expressly to animal health and disease research, (2) formula funds allow institutions some latitude in planning budgets and directing research and training programs, and (3) institutions are increasingly awarding money to researchers on the basis of intramural, peer-reviewed evaluation of scientific merit. The committee is supportive of the Special Research Grants Program because (1) most animal health problems are of national importance, (2) competitive national peer review ensures that the best researchers receive funding, (3) these competitive programs are highly visible and receive continued scrutiny by the scientific community, and (4) research awards are large enough to allow significant research efforts to be focused on a particular problem. The committee feels that the present ratio of formula funds to competitive research funds is adequate. The committee is aware of the pressure to cut federal programs budgets; however, the committee strongly recommends that the Section 1433 and the Special Research Grants programs must not be compromised, cut back, or altered.

Increased funding for the diverse animal health research programs is important to help solve national, regional, and local problems and to maintain the physical and human resources necessary for a modern research endeavor.

#### IN CONCLUSION

The Cooperative State Research Service (CSRS) is an administrative office of the U.S. Department of Agriculture (USDA) and is responsible for managing and coordinating those agricultural research programs where federally mandated dollars are used in state-supported institutions. This National Research Council Report is a critical evaluation of these CSRS programs, namely, the Special Research Grants Program (Section 1414), the Animal Health and Disease Research Program as they pertain to animal health and disease research.

These programs have an actual and potential strength beyond their size. The decentralized nature of these programs and the countless resources from which they draw throughout the nation give them unique potential unavailable from centralized federal programs, such as the Agricultural Research Service (ARS). The following paragraphs explain these special characteristics.

The programs provide greater research yield per federal dollar spent. Federal dollars allocated to state institutions, such as experiment stations and universities, are committed primarily to actual research activity. Administrative costs, salaries, and maintenance of physical facilities are absorbed largely through the operating budgets of the state institutions. In contrast, all operating costs in the ARS system are paid for with federal dollars.

Research dollars are awarded on a competitive basis and therefore improve the quality of research. Through the Special Research Grants Program, grants are awarded based on scientific merit, as judged by a peer review process. This ensures that those scientists best able to solve animal disease problems receive research dollars, regardless of their institutional affiliation.

CSRS programs encourage states to commit dollars to animal disease research. The federal legislation that created the Animal Health and Disease Research Program, Section 1433, calls for states receiving these funds in excess of \$100,000 to match these research funds by state appropriation. This requirement increases the state's participation in animal health research.

CSRS programs ensure that adequate research capabilities and facilities are maintained throughout the nation. The Hatch and Section 1433 Programs are formula programs, distributing money to the various states based on the extent of their agricultural activity and the income such activity generates. Thus, institutions in states that have sizable livestock industries receive research funds to maintain research staff and facilities. This funding increases their preparedness in the face of unexpected emergencies, such as foreign animal disease outbreaks.

CSRS programs permit the research community to be responsive to local needs. The American livestock industry has a very regional character with different species of livestock centered in different geographic locales. By channeling federal funds through state institutions, CSRS facilitates communication between local livestock producers, the commodity groups that represent them, and the institutions that carry out research. This arrangement ensures that animal disease problems that may not be national in scope but extremely costly to certain producers are addressed and resolved by competent researchers.

CSRS programs are the major source of research dollars for livestock diseases in veterinary schools and colleges. Veterinary medicine as a scientific discipline has a unique contribution to make to animal agriculture. It is an interdisciplinary field that combines experience in livestock production with training in the biomedical sciences. Veterinary researchers, by virtue of their training, can define animal disease research problems and offer novel solutions to these problems.







